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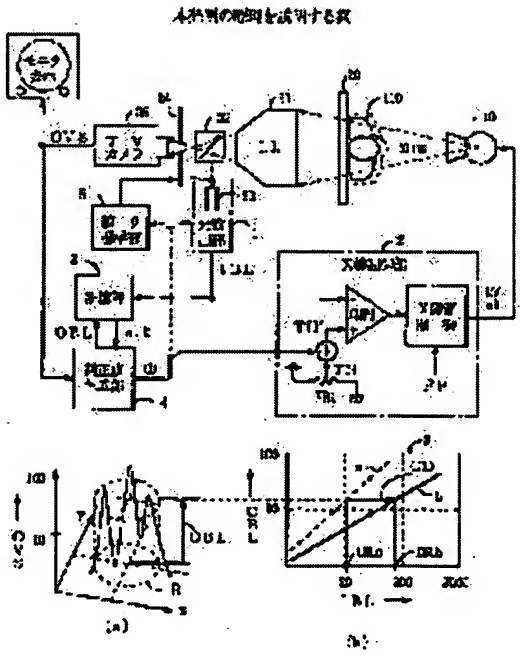
(54) X-RAY TELEVISION RECEIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an X-ray television receiver that can obtain required (from the beginning) image quality from a photographing image independently of deterioration in the sensitivity of a television camera.

SOLUTION: The X-ray television receiver that converts an X-ray fluoroscopic image of a subject into an optical image, uses a television camera to photograph it, displays a fluoroscopic image on a monitor and photographs the video image as one shot, is provided with an optical detection section 1 that detects a luminance level IBL of the optical image, an X-ray control section 2 that controls an X-ray dose at photographing so that the luminance level of the optical image reaches a prescribed level TH, a storage section 3 that stores 1st and 2nd characteristics a, b at the initial state of the television camera and at a later point of time with respect to the characteristic of an output signal level OBL of the television camera versus the luminance level of the optical image in advance and a corrected value generating section 4 that compares the 1st and 2nd characteristics a, b of the storage section 3 on the basis of the output signal level OBL of the television camera at a present point of time to generate a



correction value CD of the luminance level IBL of the optical image required for photographing and a reference level TH of the X-ray control section 2 is corrected by the correction value CD.

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] It relates the fluoroscopy image of analyte to the X-ray television equipment a photograph of can be taken by high definition (DR: digital radiography) while this invention changes the radioscopy image of analyte into an optical image, photos it with a TV camera and carries out the monitor display of the acquired fluoroscopy image on real time in more detail about X-ray television equipment.
[0002] With this kind of equipment, there are so-called fluoroscopy mode which carries out the monitor display of the radioscopy image of analyte continuously, and the so-called photography mode which takes a photograph of the radioscopy image of analyte to high definition by one shot (one frame). In fluoroscopy mode, by detecting the display brightness of a front frame and feeding this back to photography brightness (X-ray dosage) control of degree frame, it does not call at the size (physique) or the photography part of analyte, but fixed display brightness (contrast) is obtained by TV monitor. On the other hand, in photography mode, in order to take a photograph by one shot (one frame), the photography brightness (X-ray dosage) control for obtaining high definition poses a problem.
[0003]
[Description of the Prior Art] Drawing 7 is drawing explaining the conventional technique, and shows the important section block diagram of conventional X-ray television equipment. In drawing, in 10, the X-ray tube of a rotating-anode mold and 100 carry analyte, and 20 carries analyte 100. A photography table movable in the direction of a body axis (top plate), The image intensifier from which 30' changes an radioscopy image into the photography system of an radioscopy image, and 31 changes it into an optical image (I.I.), The photodetector which consists of the photomultiplier tube, a photodiode, etc. for detecting the average intensity level IBL of predetermined (attention) area etc. about the optical distributor with which 32 distributes a part of output light of I and I.31, and the optical image with which 33 was distributed (PD), The diaphragm to which AMP1 adjusts the amplifier and 34 adjusts the amount of incident light to TV camera 35 (Iris), The TV camera (TVC) by a photoconductive camera tube etc. and 36 35 A gamma converter (gamma), The image-processing section in which 41 performs a required image processing to the video data VD of the output of photography system 30', The brightness detecting element to which 42 detects the average intensity level GBL of predetermined (attention) area etc. about a video data VD, The photography brightness control section for 43' to carry out fixed control of the average intensity level IBL of I.I.31 in photography mode, The fluoroscopy brightness control section for 44' to carry out fixed control of the average intensity level GBL of the video data VD in fluoroscopy mode, The X-ray tube control section by which 70 controls the X-ray dosage (tube voltage kV, tube electric current mA, exposure pulse width w) of X-ray tube 10 according to the brightness control signal from brightness control section 43'/44', TV monitor (TVM) for 61 to carry out the monitor of the fluoroscopy image and photography (photograph) image of analyte 100 and 62 are printers (PRN) which print the photograph of analyte 100.
[0004] In addition, although not illustrated, X-ray tube 10 and photography system 30' are supported for

the surroundings of analyte 100 with C arm which supports these in the both-arms section, and the stand which carries out basis support of this C arm, enabling free rotation.
[0005] By the starting configuration, the X-ray cone beam XLCB from X-ray tube 10 penetrates analyte 100, results in I.I.31, and makes an radioscopy image on phosphor-screen 31a which consists of CsI etc. The light generated in this phosphor-screen 31a stimulates photoelectric-surface 31b on the back, and makes the photoelectron according to the amount of incident light emit, it accelerates and converges by electron lens 31c, and this emission electron is changed into the optical image of brightness according to the amount of incidence electrons in an electronic image on 31d of phosphor screens of a confrontation an epilogue and here. Furthermore, while, as for this optical image, that part is distributed to a photodetector 33 side by the optical distributor 32, that remainder extracts and carries out incidence to a TV camera 35 side through 34.
[0006] In TV camera 35, although not illustrated, each pixel capacity on a front target is beforehand charged all at once by the electron beam scan in tubing, and the pixel capacity of a bright part discharges mostly by the input of the optical image of the subsequent time amount width of face w, and the pixel capacity of a dark part discharges few. And little charging current flows in the pixel capacity which the big charging current flowed in the pixel capacity which discharged mostly on the occasion of the next electron beam scan, and discharged few, and a difference of these charging currents is taken out outside as a video signal OVS. Gamma conversion is further carried out by the gamma transducer 36, and this video signal OVS serves as a video data VD.
[0007] By the way, the physique and its photography part of the analyte 100 which carries out a fluoroscopy monitor / photography with this equipment are various, and need to prevent change of the fluoroscopy image concentration produced by difference of the rate of X-ray absorption.
[0008] This point and conventionally, at the time of fluoroscopy mode, based on the average intensity level GBL of the video data VD of a front frame, the pulse control of the fluoroscopy dosage of X-ray tube 10 was carried out so that the average intensity level GBL of degree frame might turn into fixed level (REF). On the other hand, at the time of photography mode, one shot of photography dosage of X-ray tube 10 was controlled so that the average intensity level IBL of I.I.31 turned into fixed level (TH) by one frame. Hereafter, this is explained.
[0009] The timing chart of the X-ray tube control section 70 of operation is shown in an insertion Fig. (b). In fluoroscopy mode, the pulse control of the X-ray dosage is carried out so that TV image of fixed brightness (contrast) may be obtained by the continuous frame fluoroscopy. It will be set to periodic T**33mS of the frame pulse FP if the TV monitor 61 shall be now provided with the fluoroscopy image for per second 30 frames. In fluoroscopy mode, while detecting the average intensity level GBL of the attention area (usually image core) of TV image by the brightness detecting element 42, the pulse control of the X-ray dosage is carried out so that error voltage ER may be set to 0 (that is, the average intensity level GBL of a video data VD is fixed) with the differential amplifier DAP 1 in this as compared with the criteria intensity level REF.
[0010] On the other hand, in photography mode, since it is necessary to obtain a quality photography (photograph) image by photography for one frame, feedback control [as / in the above-mentioned fluoroscopy mode] cannot be performed. Then, in the case of photography mode, a comparator CMP 1 comparing this with the predetermined threshold TH, while detecting the average intensity level IBL of the attention area of I.I.31 in photodetector 33 grade, when the average intensity level IBL of I.I.31 reaches the predetermined level TH, the exposure of an X-ray is stopped.
[0011]
[Problem(s) to be Solved by the Invention] However, with this kind of equipment, the sensibility of TV camera (mainly camera tube) 35 will deteriorate according to secular change etc.
[0012] The example of a property of the average intensity level GBL of the input average intensity-level IBL pair output video data VD of TV camera 35 is shown in an insertion Fig. (a). In drawing, the property A shows the initial property of TV camera 35, and the average intensity level GBL of the output video data VD is high signal level relatively to the input average intensity level IBL. However, if it goes through time amount, the sensibility of the camera tube deteriorates gradually, and the average

intensity level GBL of the output to the same input average intensity level IBL is falling relatively, as shown in a property B (degradation).
[0013] For this reason, by the above-mentioned conventional method, when the sensibility of TV camera 35 deteriorated according to secular change etc., even if the bright monitor image was obtained, in fluoroscopy mode, the image quality of the image which took a photograph of this had the problem referred to as having deteriorated.
[0014] In view of the trouble of the above-mentioned conventional technique, it succeeded in this invention, and the place made into the purpose is not based on sensibility degradation of a TV camera, but it is in offering the X-ray television equipment with which h necessary (to the beginning) drawing quality is acquired at the photograph.
[0015]
[Means for Solving the Problem] The above-mentioned technical problem is solved by the configuration of drawing 1 . Namely, while the X-ray television equipment of this invention (1) changes the radioscopy image of analyte 100 into an optical image, taking a photograph with TV camera 35 and carrying out the monitor display of the acquired fluoroscopy image on real time The fluoroscopy image of analyte 100 is set to the X-ray television equipment a photograph of can be taken by one shot. The photodetection section 1 which detects the intensity level IBL of an optical image, and the X-ray control section 2 which controls the X-ray dosage at the time of photography so that the intensity level IBL of an optical image turns into the predetermined reference level TH, The storage section 3 which memorizes the 1st property a in the initial state of TV camera 35, and the 2nd property b at the time of after that beforehand per property of the output-signal level OBL of intensity-level IBL pair TV camera 35 of an optical image, It has the correction value generation section 4 which generates the correction value CD of the intensity level IBL of an optical image required for photography for the 1st and 2nd property a and b of said storage section 3 [based on the output-signal level OBL of a TV camera at present]. The predetermined reference level TH of the X-ray control section 2 is amended with said correction value CD.
[0016] In the insertion Fig. (b) of drawing 1 , the storage section 3 has memorized the 1st property a in the initial state of TV camera 35, and the 2nd property b at the time of after that beforehand per property of the output-signal level OBL of intensity-level IBL pair TV camera 35 of an optical image. It was intensity-level IBL=IBLa of an optical image required as the 1st property a shows, in order to obtain the output-signal level OBL of TV camera 35 in the initial state of TV camera 35. However, since it has deteriorated as the sensibility of TV camera 35 shows in the 2nd property b at present, it is increasing to intensity-level IBL=IBLb of an optical image required in order to obtain the same signal level OBL to the output of TV camera 35.
[0017] An insertion Fig. (a) is referred to. In this condition furthermore, the correction value generation section 4 Based on the output-signal level OBL of the TV camera in the condition of having seen through analyte 100 preferably The 1st and 2nd property a and b in the storage section 3 is compared, the correction value CD of the intensity level IBL of an optical image required for photography (=IBLb-IBLa) is generated, and the predetermined reference level TH of the X-ray control section 2 is amended to TH'=TH+CD with this correction value CD.
[0018] Thereby, at the time of photography, it is amended so that the X-ray dosage of X-ray tube 10 may serve as intensity-level IBLb (it corresponds to the output-signal level OBL required for a TV camera at present) of an optical image required for the photography concerned (increase). Therefore, according to this invention (1), it is not based on secular change (sensibility degradation) of TV camera 35, but the drawing quality (brightness and contrast) of regularity (to the beginning) is acquired by the photograph.
[0019] Moreover, the X-ray television equipment of this invention (2) is set to the X-ray television equipment which will be the above-mentioned requisite. The photodetection section 1 which detects the intensity level IBL of an optical image, and the X-ray control section 2 which controls the X-ray dosage at the time of photography so that the intensity level IBL of an optical image turns into the predetermined reference level TH, The storage section 3 which memorizes the 1st property a in the

initial state of TV camera 35, and the 2nd property b at the time of after that beforehand per property of the output-signal level OBL of intensity-level IBL pair TV camera 35 of an optical image, It has the correction value generation section 4 which generates the correction value CD of the intensity level IBL of an optical image required for photography for the 1st and 2nd property a and b of said storage section 3 [based on the output-signal level OBL of a TV camera at present], and the detection gain of the photodetection section 1 is amended with said correction value CD.

[0020] In this invention (2), the predetermined reference level TH of the X-ray control section 2 is replaced with that [amendment (it increases)] with correction value CD like above-mentioned this invention (1), and it amends so that detection gain of the photodetection section 1 may be conversely made small with correction value CD. Thereby, when satisfied with a comparator CMP 1 of detecting-signal IBL=TH, it is intensity-level IBL=IBLb (it corresponds to the output-signal level OBL required for a TV camera at present) of the optical image which carries out incidence to TV camera 35. Therefore, according to this invention (2), it is not based on secular change (sensibility degradation) of TV camera 35, but the drawing quality (brightness and contrast) of regularity (to the beginning) is acquired by the photograph.

[0021] Moreover, the X-ray television equipment of this invention (3) is set to the X-ray television equipment which will be the above-mentioned requisite. The photodetection section 1 which detects the intensity level IBL of an optical image, and the X-ray control section 2 which controls the X-ray dosage at the time of photography so that the intensity level IBL of an optical image turns into the predetermined reference level TH, The storage section 3 which memorizes the 1st property a in the initial state of TV camera 35, and the 2nd property b at the time of after that beforehand per property of the output-signal level OBL of intensity-level IBL pair TV camera 35 of an optical image, It has the correction value generation section 4 which generates the correction value CD of the intensity level IBL of an optical image required for photography for the 1st and 2nd property a and b of said storage section 3 [based on the output-signal level OBL of a TV camera at present]. The detection sensitivity of the photo detector 33 in the photodetection section 1 is amended with said correction value CD.

[0022] In this invention (3), with correction value CD, the detection sensitivity of the photo detectors 33 in the photodetection section 1 (photomultiplier tube etc.) is amended so that it may become small. Thereby, when satisfied with a comparator CMP 1 of detecting-signal IBL=TH, it is intensity-level IBL=IBLb (it corresponds to the output-signal level OBL required for a TV camera at present) of the optical image which carries out incidence to TV camera 35. Therefore, according to this invention (3), it is not based on secular change (sensibility degradation) of TV camera 35, but the drawing quality (brightness and contrast) of regularity (to the beginning) is acquired by the photograph.

[0023] Moreover, the X-ray television equipment of this invention (4) is set to the X-ray television equipment which will be the above-mentioned requisite. The photodetection section 1 which detects the intensity level IBL of an optical image, and the photodetection section 1 and the diaphragm device section 5 prepared between TV cameras 35, The X-ray control section 2 which controls the X-ray dosage at the time of photography so that the intensity level IBL of an optical image turns into the predetermined reference level TH, The storage section 3 which memorizes the 1st property a in the initial state of a TV camera, and the 2nd property b at the time of after that beforehand per property of the output-signal level OBL of the intensity-level IBL pair TV camera of an optical image, It has the correction value generation section 4 which generates the correction value CD of the intensity level IBL of an optical image required for photography for the 1st and 2nd property a and b of said storage section 3 [based on the output-signal level OBL of a TV camera at present], and extracts with said correction value CD, and the amount of drawing of the device section 5 is amended.

[0024] In this invention (4), it extracts with correction value CD, and the amount of drawing of the device section 5 is amended so that it may become bright. Thereby, when satisfied with a comparator CMP 1 of detecting-signal IBL=TH, it is intensity-level IBL=IBLb (it corresponds to the output-signal level OBL required for a TV camera at present) of the optical image which carries out incidence to TV camera 35. Therefore, according to this invention (4), it is not based on secular change (sensibility degradation) of TV camera 35, but the drawing quality (brightness and contrast) of regularity (to the

beginning) is acquired by the photograph.
[0025]
[Embodiment of the Invention] Hereafter, according to an accompanying drawing, the gestalt of two or more suitable operations for this invention is explained to a detail. In addition, the same sign is taken as the same or the thing which shows a considerable part through a complete diagram.
[0026] Drawing 2 is the important section block diagram of the X-ray television equipment by the gestalt of the 1st operation, and shows the case where the sensibility degraded minute of TV camera 35 is amended, by amending threshold level TH for X-ray limitation at the time of photography (increase).
[0027] The photography brightness control section for carrying out fixed control of the average intensity level IBL of I.I. [in / 30 and / in 43 / photography mode]31 in drawing, [the photography system of an radioscopy image] The fluoroscopy brightness control section for 44 to carry out fixed control of the average intensity level GBL of the video data VD in fluoroscopy mode, The main memory which consists of RAM for which the CPU uses the control section to which 50 performs main control/processing of this equipment, and 51, and CPU51 uses 52, a ROM, etc. (MM), The circumference circuit control section to which 53 performs an exchange of various control signals and data between CPU51 and its circumference circuit section (PIO), The nonvolatile memory which consists of an EEPROM 54 remembers each sensibility data (IBL-OBL property) at the time (this time) of the initial state about TV camera 35, and after that to be (equivalent to the storage section 3 of drawing 1), The console section (CSL) in which 55 includes the common bus of CPU51, and 63 includes a keyboard, various actuation switches, etc., and 64 are disk units (DSK) which store an image file, various application programs, etc. About other configurations, it is the same as that of what described above-mentioned drawing 7 , and is good.
[0028] In addition, the image Fig. in the case of detecting the average intensity level OBL of a video signal OVS was shown in the insertion Fig. (a) of above-mentioned drawing 1 . with the gestalt of this operation of drawing 2 , this average intensity level OBL can be set in the attention area (usually image core) R -- it asks by CPU51 as the average of each video signal OVS before gamma conversion preferably. Therefore, the sensibility property of TV camera 35 is detectable to a dynamic range with large brightness at a crossover form. On the other hand, in the brightness detecting element 42 of drawing 2 , it asks for the average intensity level GBL as the average of each video data VD after gamma conversion in consideration of people's vision property. However, about the location and size of the attention area R, similarity is given among both. Moreover, the photodetector 33 has detected the average intensity level IBL of the area corresponding to this attention area R similarly. In this way, the coordination of a comparison of various average intensity levels is maintained.
[0029] By the starting configuration, in fluoroscopy mode, while detecting the average intensity level GBL of the attention area R of TV image by the brightness detecting element 42, the pulse control of the X-ray dosage is carried out so that error voltage ER may be set to 0 (that is, the average intensity level GBL of a video data VD is fixed) with the differential amplifier DAP 1 in this as compared with the criteria intensity level REF. Therefore, it does not call at the physique or the photography part of analyte 100, but the fluoroscopy image of the brightness and contrast of regularity (to the beginning) is acquired by the TV monitor 61.
[0030] On the other hand, in photography mode, a comparator CMP 1 comparing this with predetermined threshold TH', while detecting the average intensity level IBL of the attention area R of I.I.31 in photodetector 33 grade, when the average intensity level IBL of I.I.31 reaches predetermined level TH', the exposure of an X-ray is stopped. Hereafter, the photography correction-by-sensitiveness processing by CPU51 is explained to a detail.
[0031] Drawing 3 is the flow chart of the photography correction-by-sensitiveness processing by the gestalt of the 1st operation. Drawing 3 (A) shows sensibility data acquisition processing, and performs this processing to periodical or proper timing at the beginning [of this equipment] of operation, and after that. In addition, this processing is performed in the fluoroscopy mode in the condition that analyte 100 does not exist. At step S11, the switch SW of the fluoroscopy brightness control section 44 is connected to Terminal b side. At step S12, the brightness data REF for reference are set up from CPU51.

Thereby, pulse irradiation of the small X-ray dosage is carried out at first. At step S13, the detecting signal IBL of the photodetector 33 at that time and the video signal OVS of the predetermined area R of TV camera 35 are acquired, the average intensity level OBL for which it asked from the video signal OVS of them is matched with the average intensity level IBL of said acquired optical image, and it stores in nonvolatile memory 54. At step S14, it distinguishes whether the completion of acquisition of all the sensibility data of a necessary range (required dynamic range) was carried out, and when having not completed, return and the new brightness data REF for reference are set as step S12, and the same processing as the above is repeated. If it progresses similarly and becomes all sensibility data acquisition completion of a necessary range by distinction of step S14 soon hereafter, it will progress to step S15, Switch SW will be connected to Terminal a side, and it will escape from this processing.

[0032] By the above-mentioned processing, all the sensibility data (IBL-OBL property a) in the time of operation of this equipment (TV camera 35) are first stored in the 1st predetermined area, and address storing of all the sensibility data (IBL-OBL property b) at present [each] is carried out after that in the 2nd predetermined area each time.

[0033] Drawing 3 (B) shows photography correction-by-sensitiveness processing (equivalent to the correction value generation section 4 of drawing 1), and is performed in the fluoroscopy mode in front of photography by this equipment. In addition, in case photography is started, the fluoroscopy monitor of analyte 100 is usually performed just before that, in this condition, according to an operation of the fluoroscopy brightness control section 44, it does not call at the physique or its photography part of analyte 100, but the brightness of regularity has already been obtained by the TV monitor 61 from the beginning. In this condition, a video signal OVS is acquired in step S21, and it asks for the average intensity level OBL of the predetermined area R at step S22. At step S23, with reference to nonvolatile memory 54, the initial state about TV camera 35 is compared with each present sensibility data {equivalent to the properties a and b of drawing 1 (b)} based on the average intensity level OBL for which it asked, and the amendment data CD about the average intensity level IBL (X-ray dosage) are generated. At step S24, the generated amendment data CD are outputted to the photography brightness control section 43, and it escapes from this processing.

[0034] Therefore, threshold TH' of the photography brightness control section 43 at the time of subsequent photography is amended by TH'=TH+CD (increase), it increases so that X-ray dosage may offset the sensibility degraded minute of TV camera 35 by this, and the brightness of regularity (to the beginning) and contrast are acquired by the photograph photoed one shot in this condition.

[0035] Drawing 4 is the important section block diagram of the X-ray television equipment by the gestalt of the 2nd operation, and shows the case where the sensibility degraded minute of TV camera 35 is amended, by amending detection gain of the average intensity level IBL of I.I.31 at the time of photography (reduction). This amplifier AMP 1 is equipped with the terminal for gain control in drawing. Moreover, the adder (+) is deleted in this photography brightness control section 43. About other configurations, it is the same as that of above-mentioned drawing 2 , and is good.

[0036] CPU51 in this case generates the gain control signal g which offsets the sensibility degraded minute of TV camera 35 based on the amendment data CD for which it asked by processing of above-mentioned drawing 3 (B), and adds this to the amplifier AMP 1 at the time of photography. Therefore, according to the amendment data CD, gain reduction of average intensity-level IBL' of the input of the photography brightness control section 43 at the time of photography is carried out, it increases so that the X-ray dosage of X-ray tube 10 may offset the sensibility degraded minute of TV camera 35 by this, and the brightness of regularity (to the beginning) and contrast are acquired by the photograph therefore photoed one shot in this condition.

[0037] Drawing 5 is the important section block diagram of the X-ray television equipment by the gestalt of the 3rd operation, and shows the case where the sensibility degraded minute of TV camera 35 is amended, by amending detection sensitivity of the photodetector 33 at the time of photography (reduction). In drawing, 33 is a photo-multiplier (PM) and 33a is the power supply section for bias of a photo-multiplier 33. In addition, a photoelectron multiplication factor changes according to the bias voltage which impresses a photo-multiplier 33 to this.

[0038] CPU51 in this case generates the signal VC for bias control which offsets the sensibility degraded minute of TV camera 35 based on the amendment data CD for which it asked by processing of above-mentioned drawing 3 (B), and adds this to power supply section 33a for bias at the time of photography. Therefore, according to the amendment data CD, gain reduction of average intensity-level IBL' of the input of the photography brightness control section 43 at the time of photography is carried out, it increases so that the X-ray dosage of X-ray tube 10 may offset the sensibility degraded minute of TV camera 35 by this, and the brightness of regularity (to the beginning) and contrast are acquired by the photograph therefore photoed one shot in this condition.
[0039] Drawing 6 is the important section block diagram of the X-ray television equipment by the gestalt of the 4th operation, and shows the case where the sensibility degraded minute of TV camera 35 is amended, by amending the diaphragm 34 at the time of photography (bright). In drawing, 34a is an iris mechanical component which extracts and controls the amount of openings of 34.
[0040] CPU51 in this case generates the signal VC for throttling control which offsets the sensibility degraded minute of TV camera 35 based on the amendment data CD for which it asked by processing of above-mentioned drawing 3 (B), and adds this to iris mechanical-component 34a at the time of photography. Therefore, even if it does not change the X-ray dosage of X-ray tube 10 in this case, the optical image inputted into TV camera 35 at the time of photography is made bright according to the amendment data CD, and the brightness of regularity (to the beginning) and contrast are acquired by the photograph therefore photoed one shot in this condition.
[0041] In addition, although detected or compared in quest of the average intensity level of each predetermined area R per the optical image or video data with the gestalt of each above-mentioned implementation, it does not restrict to this. Otherwise, you may compare with the maximum intensity level of for example, the predetermined area R etc.
[0042] Moreover, although the gestalt of two or more suitable operations for above-mentioned this invention was described, within limits which do not deviate from this invention thought, the configuration of each part and control are performed and various change of these combination cannot be made also until it says.
[0043]
[Effect of the Invention] The place which according to this invention it is not based on secular change (sensibility degradation) of a TV camera, but the drawing quality (brightness and contrast) of regularity (to the beginning) is acquired by the photograph as stated above, and contributes to an image quality improvement of photography is very large.

[Translation done.]